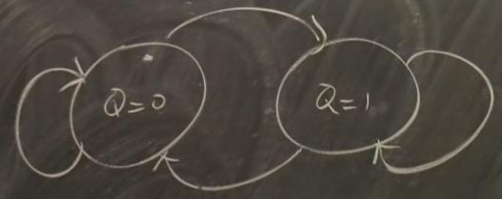
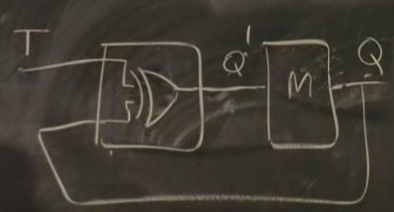
set
reset
hold
toggle



Equazioni caratteristiche dei FF

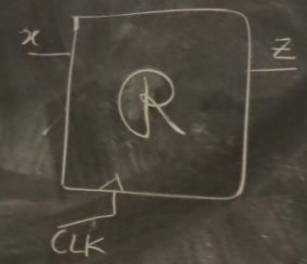
$$f\begin{cases} Q' = S + \bar{R}Q & [SR] \\ Q' = D & [D] \\ Q' = J\bar{Q} + \bar{K}Q & [Jk] \\ Q' = T \oplus Q & [T] \end{cases}$$

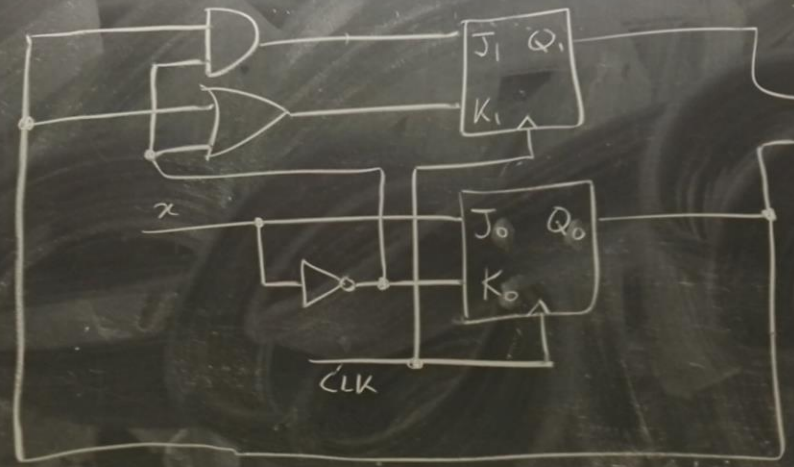
$(g = \text{identità})$



Analisi
di reti

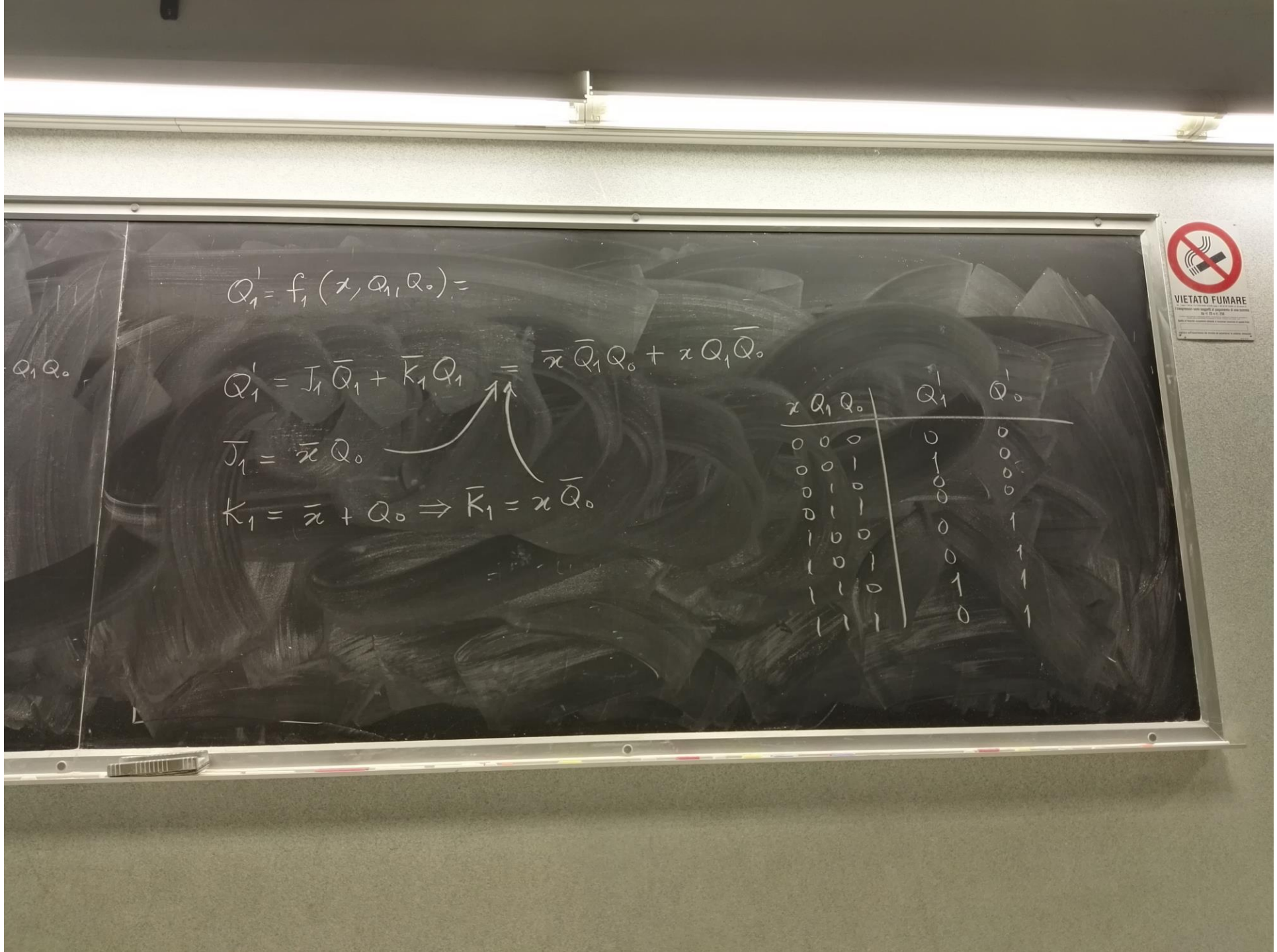
Analisi & Sintesi
di reti sequenziali

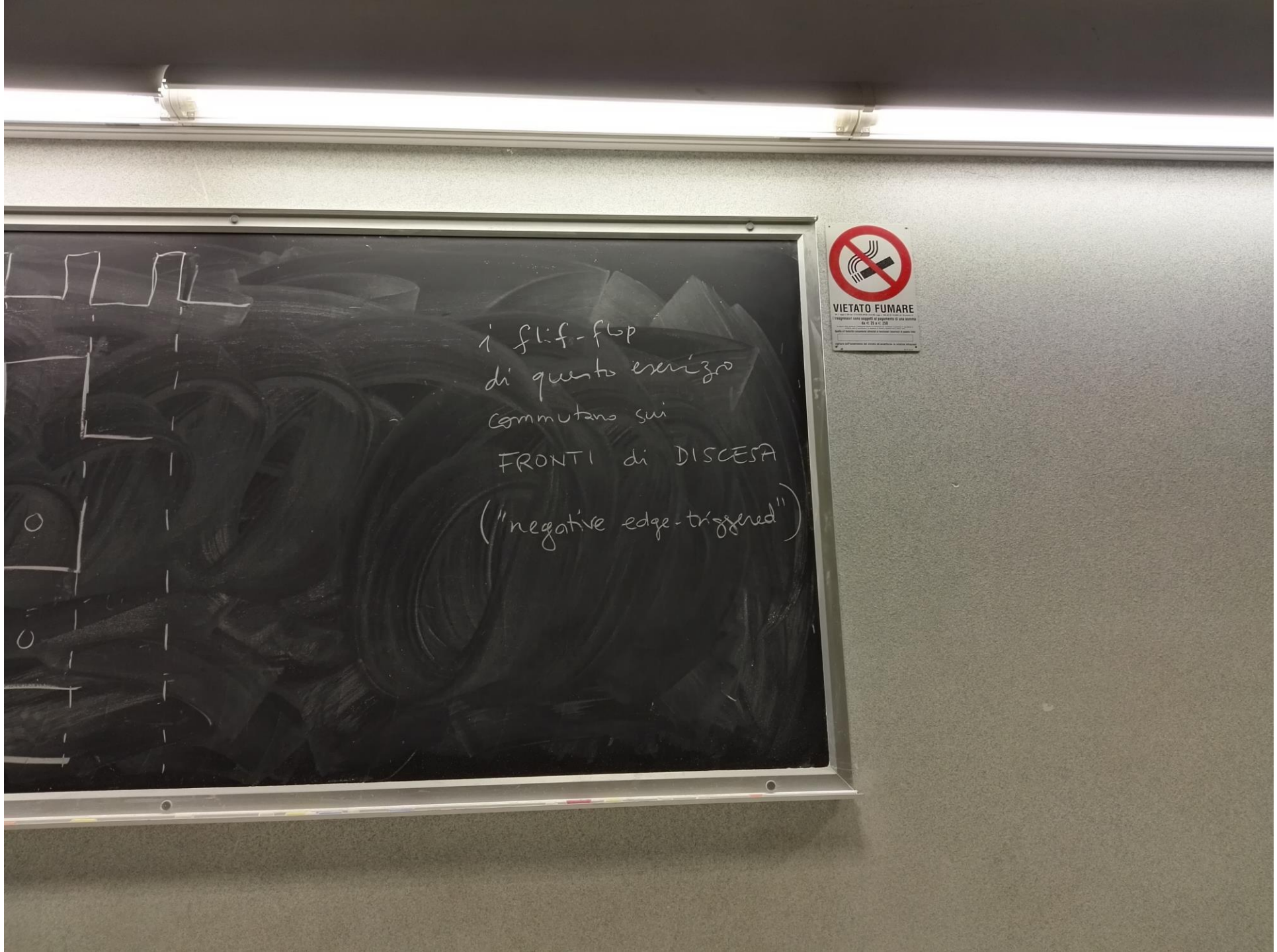


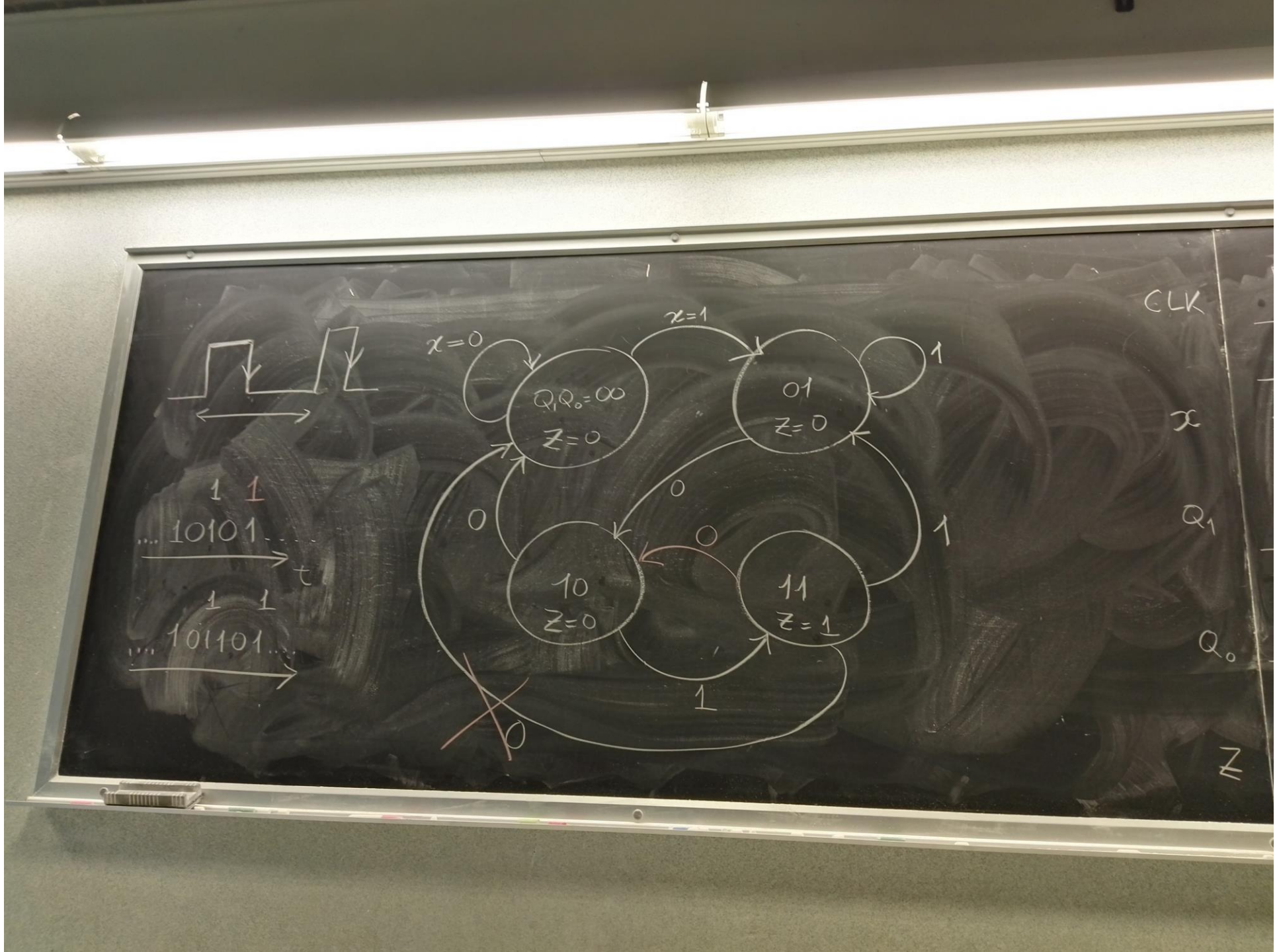


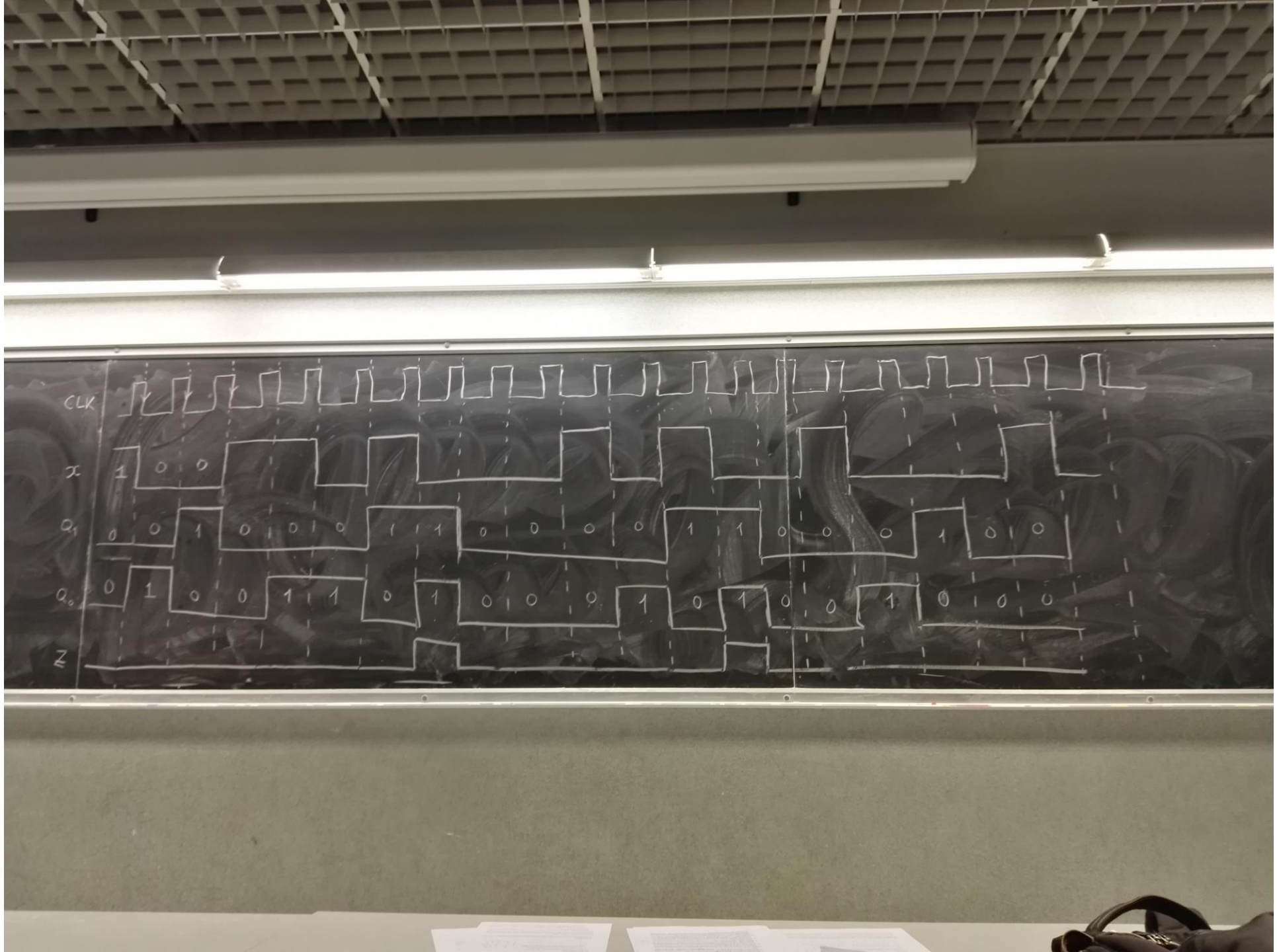
$Z = Q_1 Q_0$

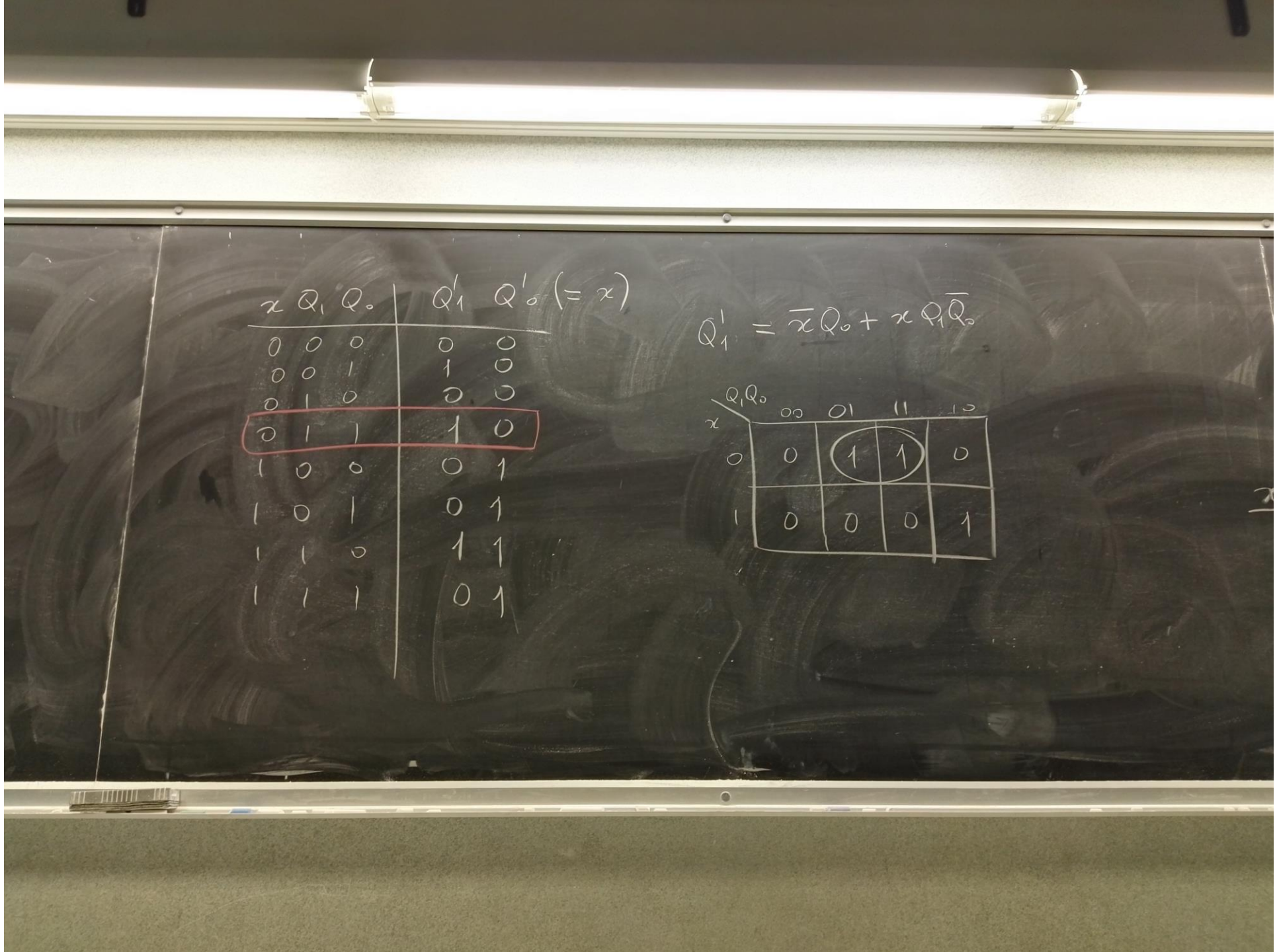
$Q'_0 = x$

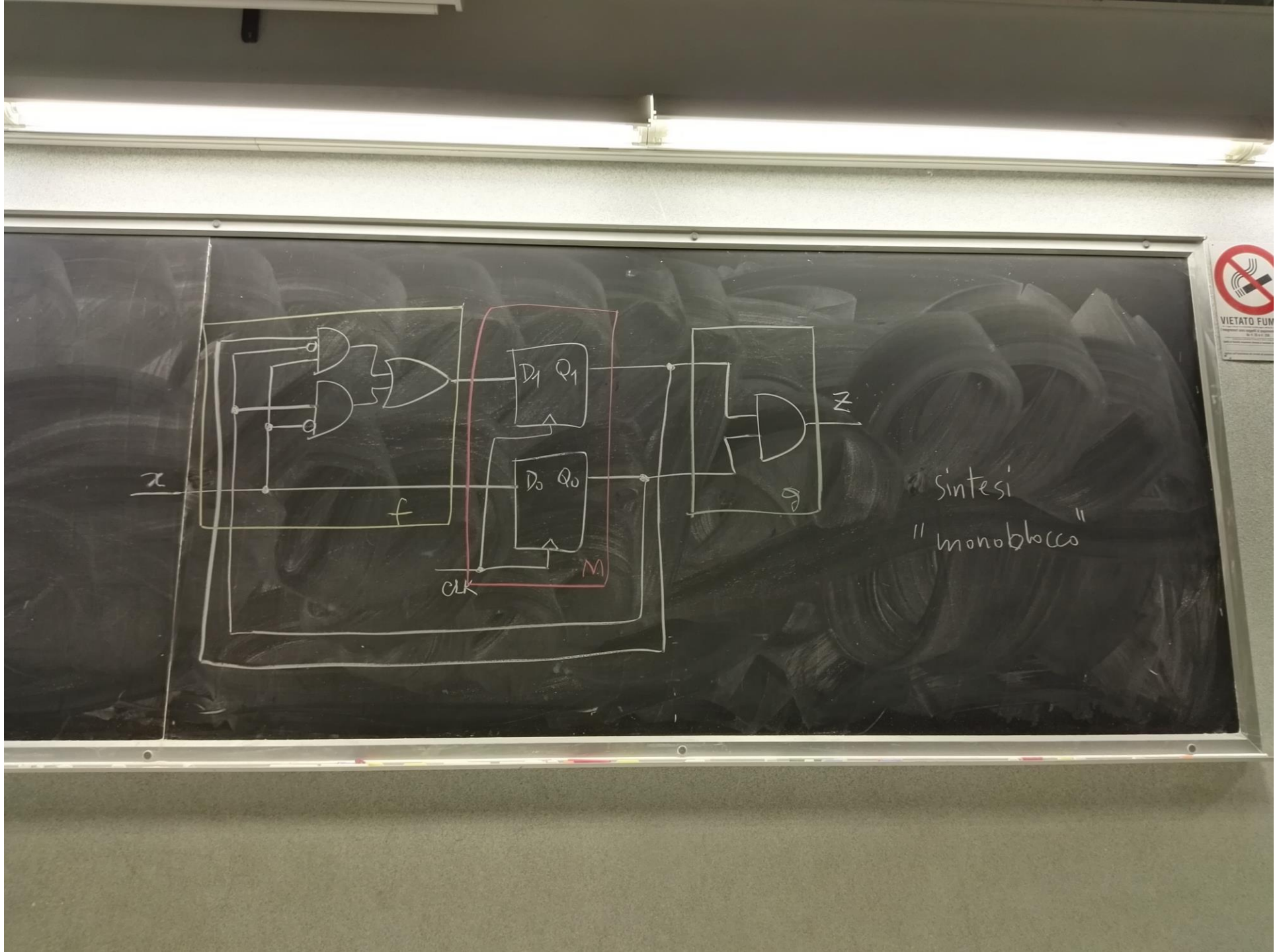

$Q_1' = f_1(x, Q_1, Q_0) =$
$Q_1' = J_1\bar{Q}_1 + \bar{K}_1 Q_1 = \bar{x}\bar{Q}_1 Q_0 + x Q_1 \bar{Q}_0$
$J_1 = \bar{x} Q_0$
$K_1 = \bar{x} + Q_0 \Rightarrow \bar{K}_1 = x\bar{Q}_0$
$x\,Q_1\,Q_0$ | Q_1' | Q_0'
VIETATO FUMARE

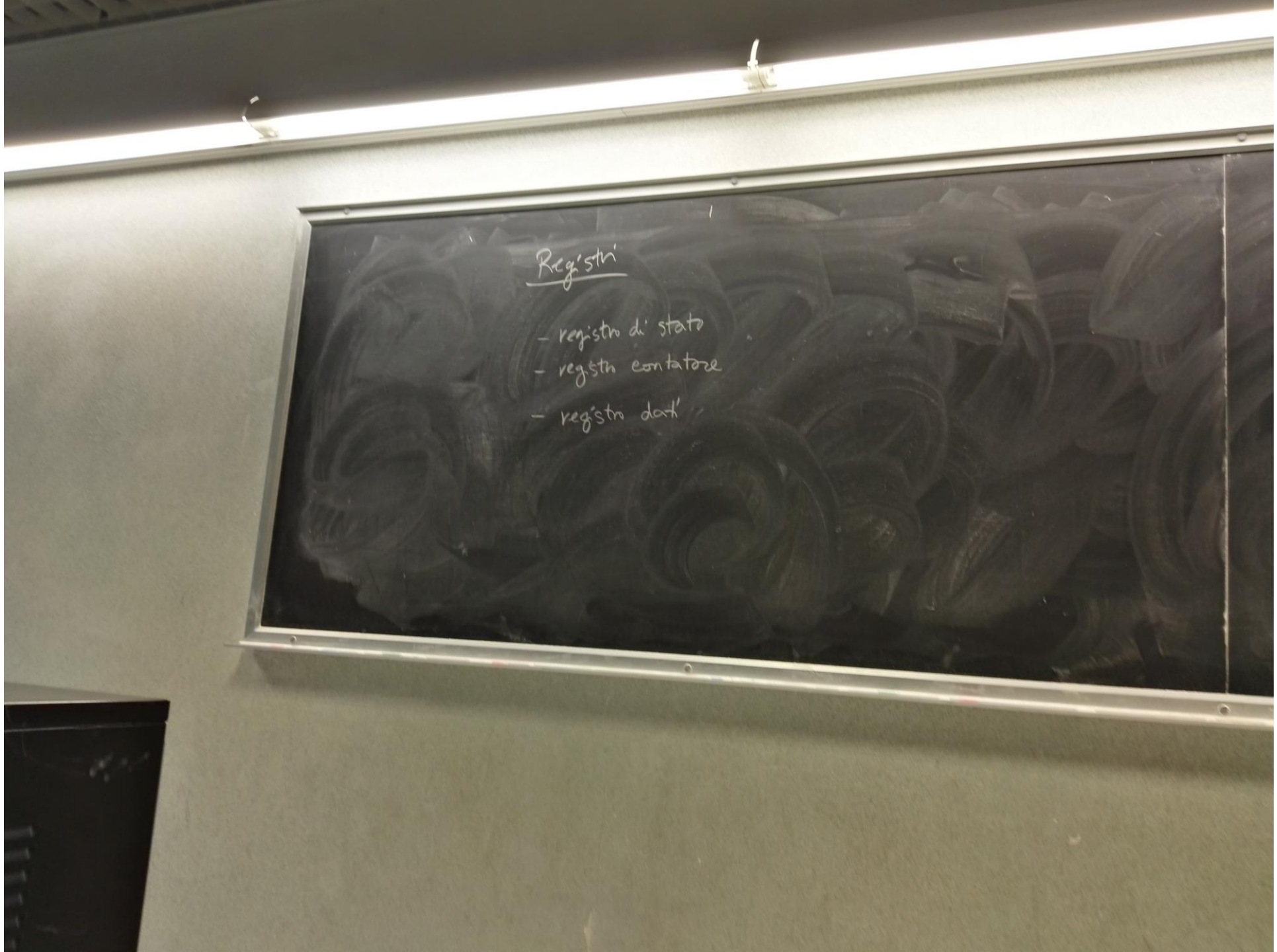

i flip-flop
di questo esercizio
commutano sui
FRONTI di DISCESA
("negative edge-triggered")
VIETATO FUMARE

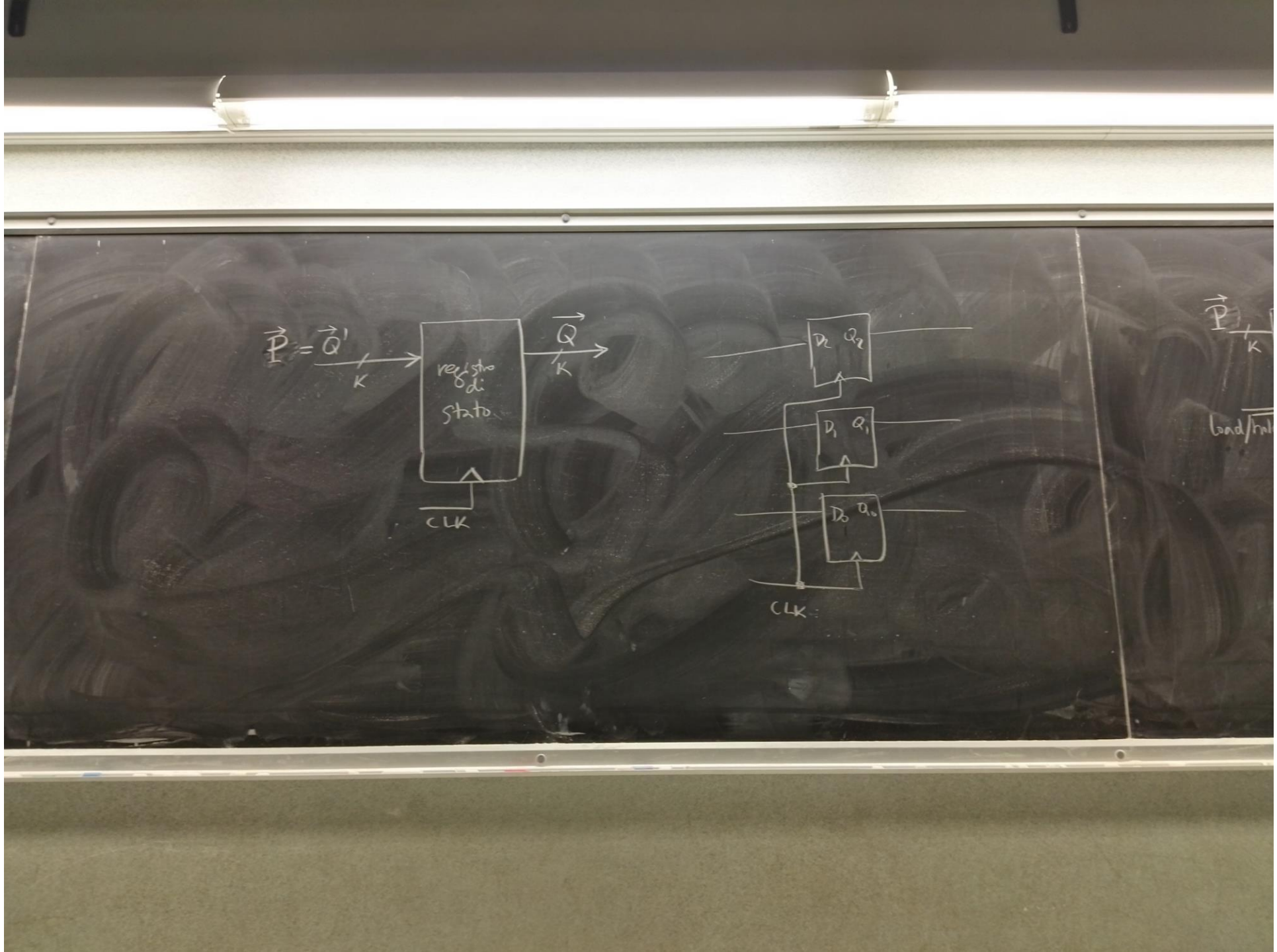

CLK
x
Q1
Q0
Z
x=0
x=1
Q1Q0=00
Z=0
01
Z=0
10
Z=0
11
Z=1
1 1
...10101...
t
1 1
...101101...

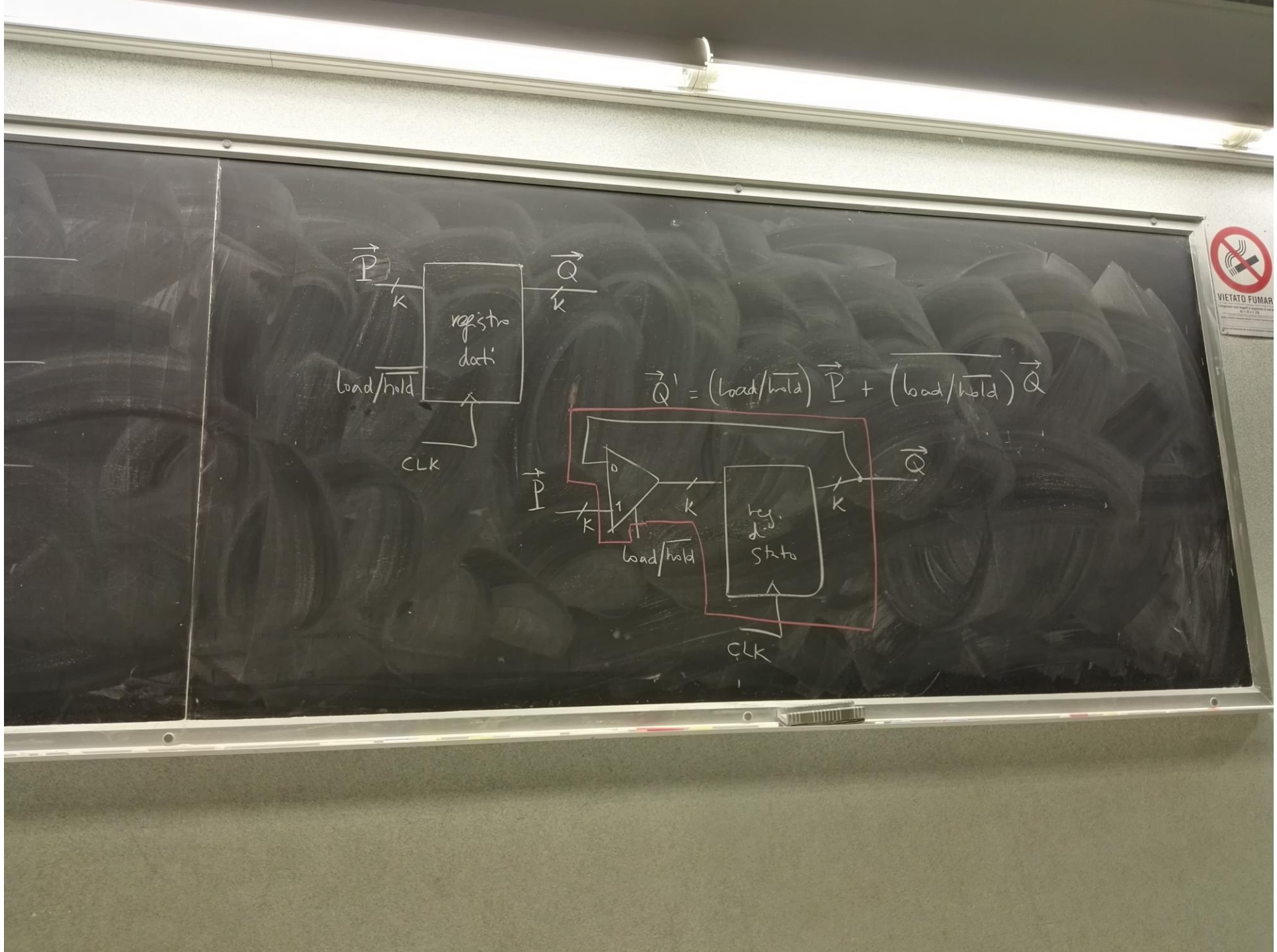

CLK
x
Q_1
Q_0
Z

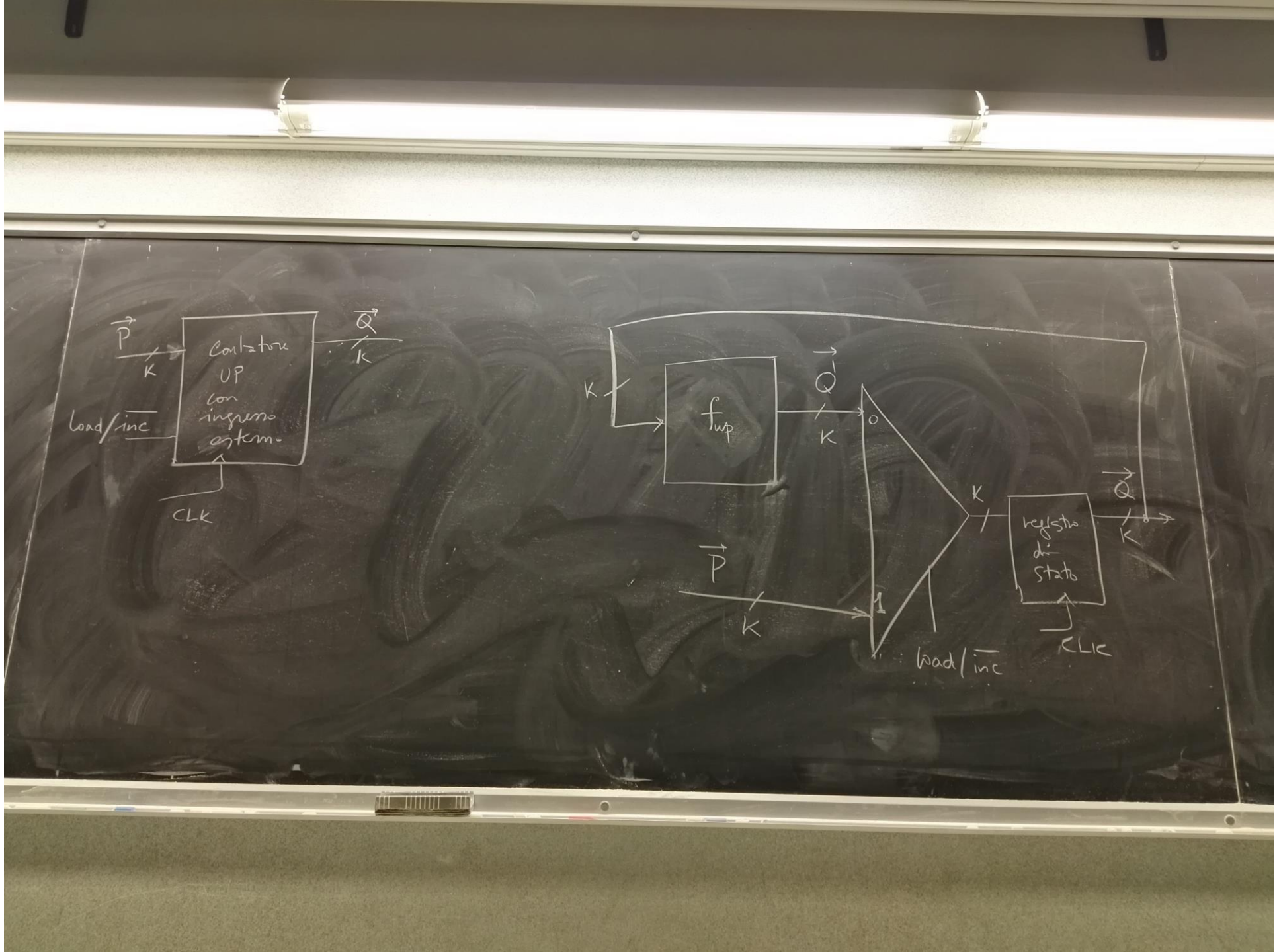

x Q1 Q0 | Q'1 Q'0 (= x)
0 0 0 | 0 0
0 0 1 | 1 0
0 1 0 | 0 0
0 1 1 | 1 0
1 0 0 | 0 1
1 0 1 | 0 1
1 1 0 | 1 1
1 1 1 | 0 1
Q'1 = x̄Q0 + xQ1Q̄0
Q1Q0
00 01 11 10
x
0 0 1 1 0
1 0 0 0 1

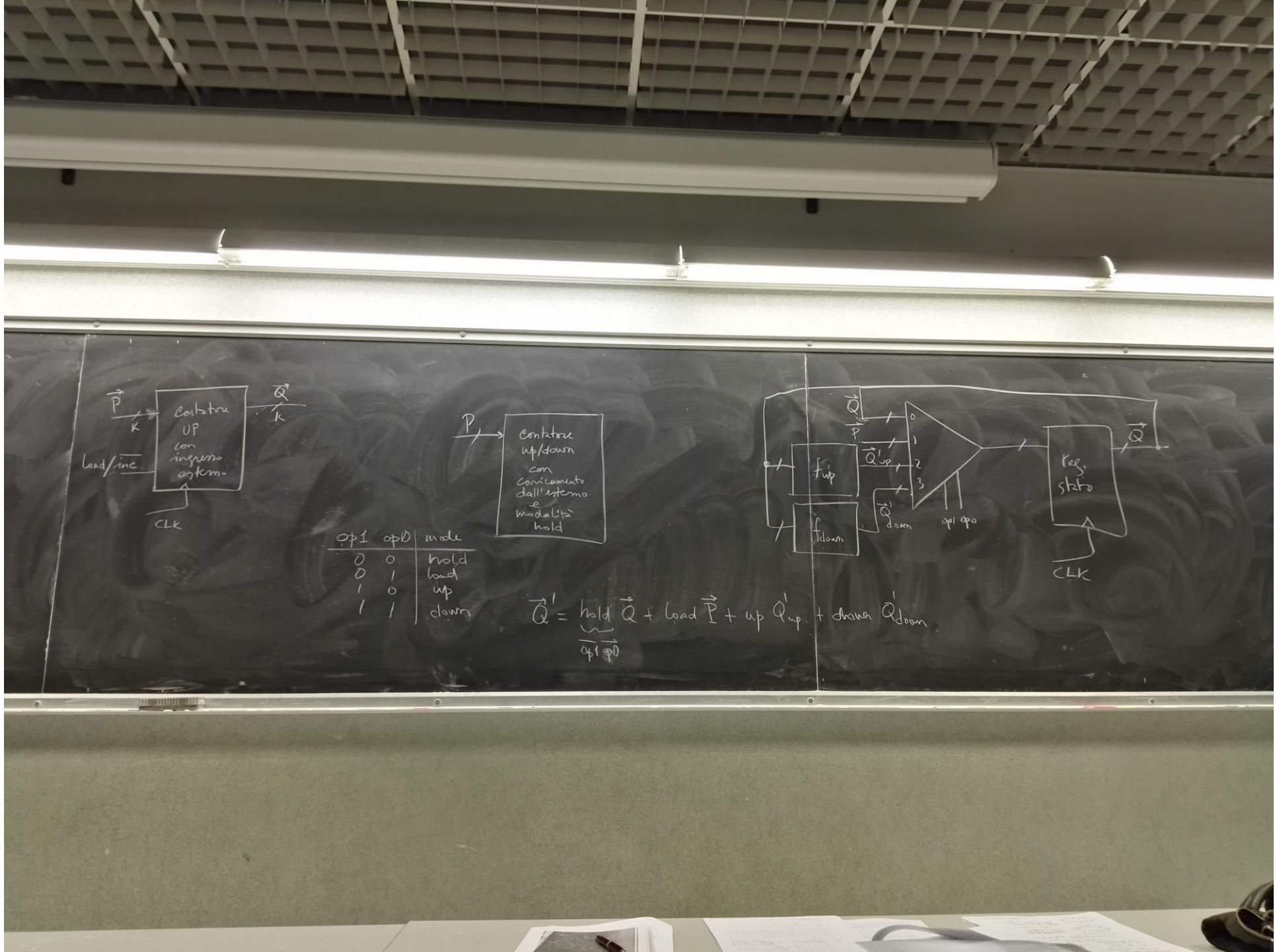

x
f
D1 Q1
D0 Q0
M
CLK
g
z
Sintesi
"monoblocco"

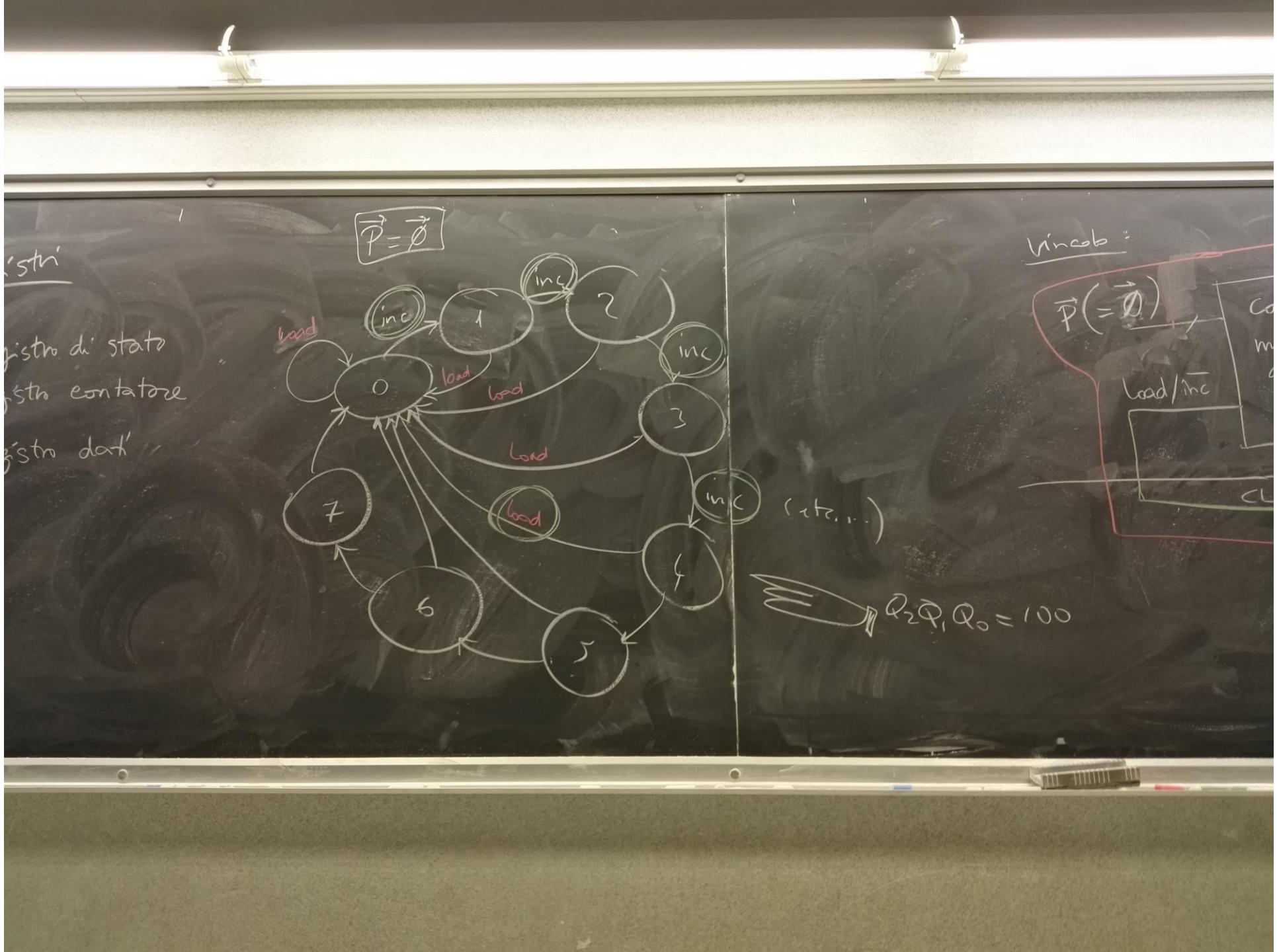

Registri
- registro di stato
- registro contatore
- registro dati

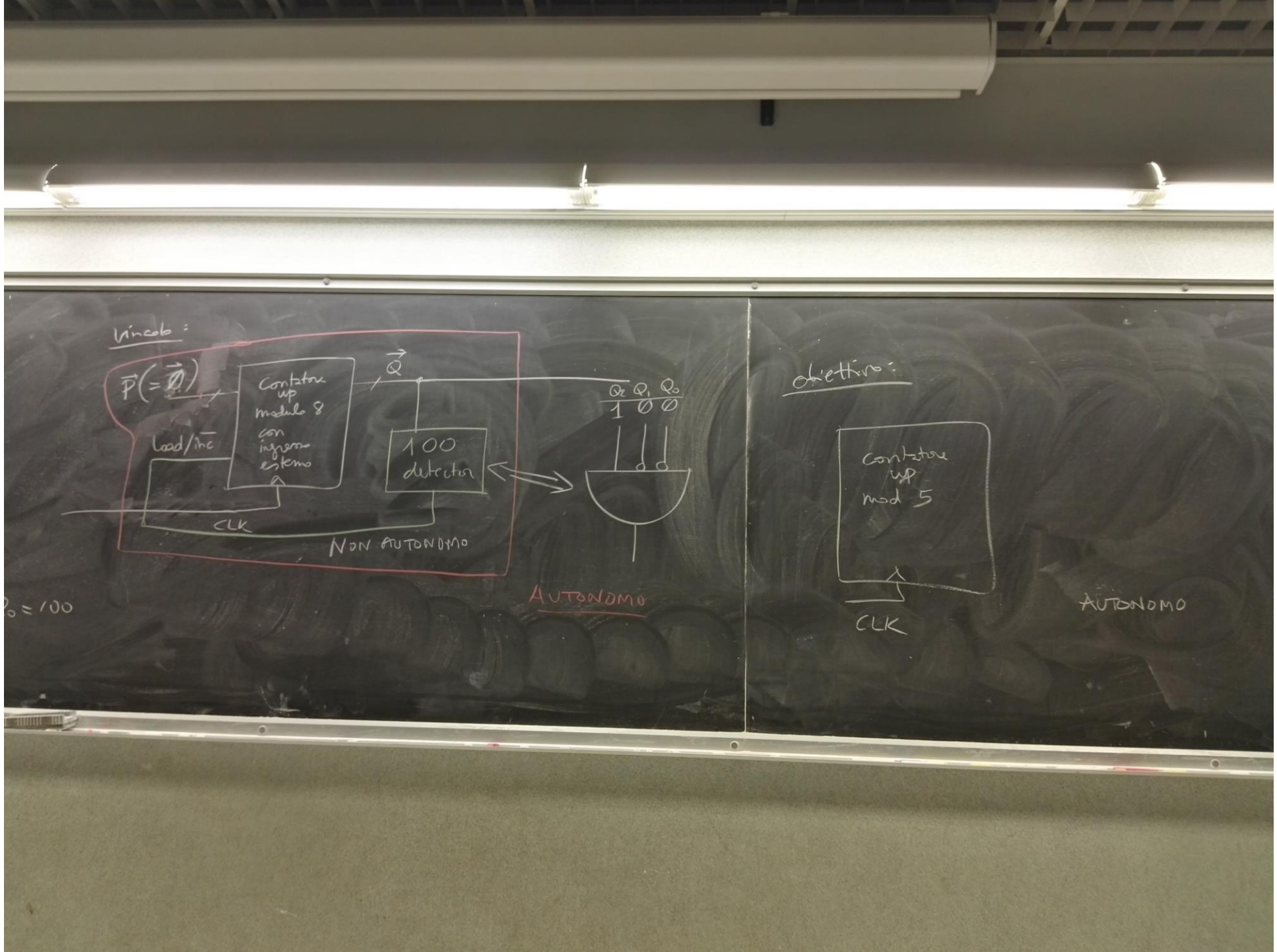

$\vec{P} = \vec{Q}'$
K
registro di stato
$\vec{Q}$
K
CLK
D_2 Q_2
D_1 Q_1
D_0 Q_0
CLK
$\vec{P}$
K

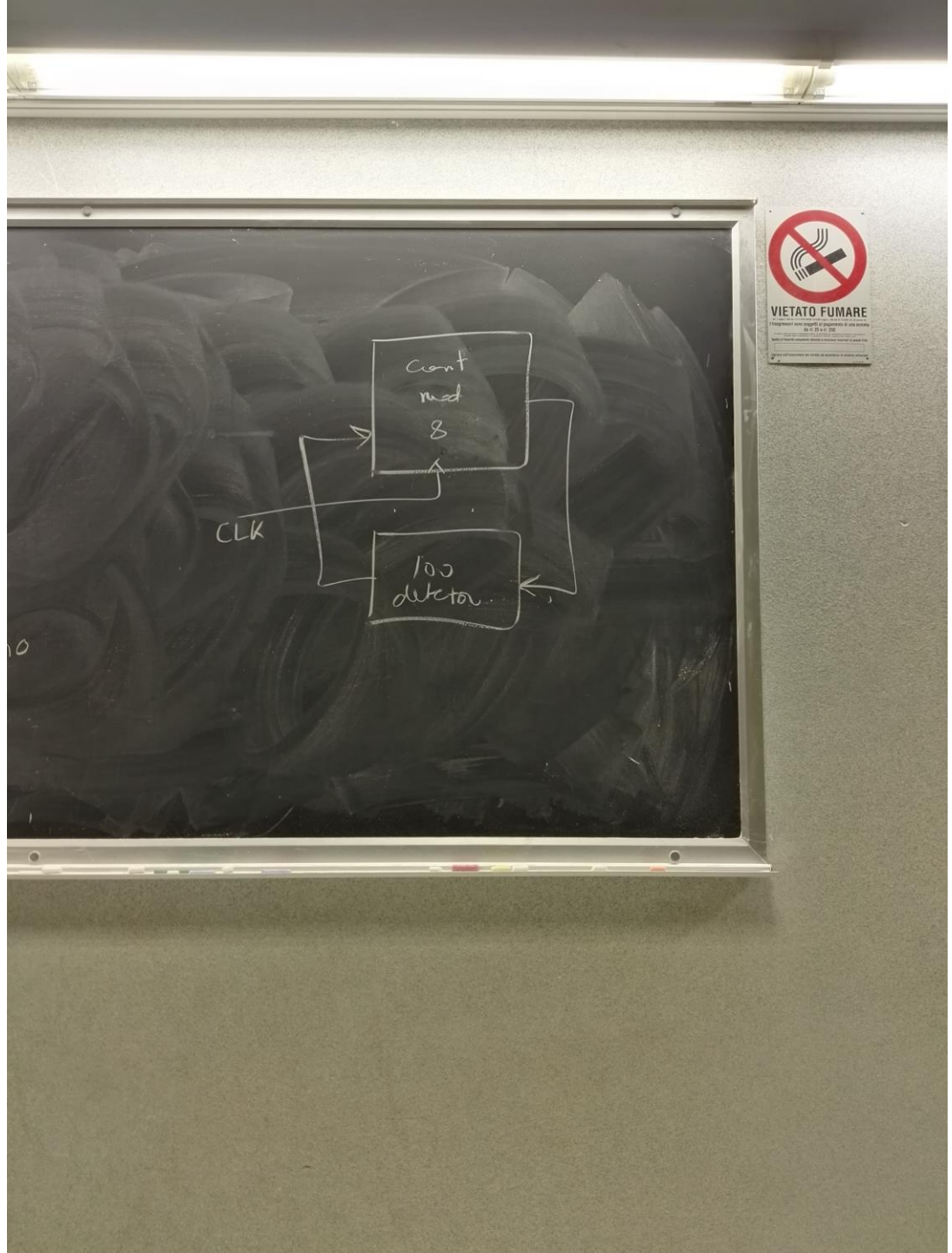

$\vec{P}$
k
registro dati
$\vec{Q}$
k
load/hold
CLK
$\vec{Q}' = (\text{load}/\overline{\text{hold}})\,\vec{P} + \overline{(\text{load}/\overline{\text{hold}})}\,\vec{Q}$
$\vec{P}$
0
1
k
k
k
reg. di stato
$\vec{Q}$
load/hold
CLK
VIETATO FUMARE


P
K
load/inc
Contatore UP con ingresso esterno
Q
K
CLK
K
fup
Q
K
0
1
K
registro di stato
Q
K
P
K
load/inc
CLK


P
K
Contatore UP con ingresso esterno
Q
K
load/inc
CLK
P
Contatore up/down con caricamento dall'esterno e modalità hold
op1 op0 | mode
0 0 | hold
0 1 | load
1 0 | up
1 1 | down
Q'
P
Q'up
Q'down
fup
fdown
0
1
2
3
op1 op0
reg. stato
Q
CLK
Q' = hold Q + load P + up Q'up + down Q'down
op1 op0


gistri
gistro di stato
gistro contatore
gistro dati
$\vec{P} = \vec{0}$
inc
load
0
1
2
3
4
5
6
7
$Q_2 Q_1 Q_0 = 100$
Vincoli:
$\vec{P} (= \vec{0})$
Load/inc


vincolo:
$\vec{P}(=\vec{0})$
Contatore up modulo 8 con ingresso esterno
$\vec{Q}$
Load/$\overline{inc}$
100 detector
CLK
NON AUTONOMO
Q_2 Q_1 Q_0
1 0 0
AUTONOMO
$_0 = 100$
obiettivo:
Contatore up mod 5
CLK
AUTONOMO


Count
mod
8
CLK
100
detector
VIETATO FUMARE